U.S. Department of Justice
National Institute of Justice

National Institute of Justice / Technology Assessment

October 1988 TECHNOLOGY ASSESSMENT PROGRAM

Michigan State Police Test 1989 Patrol Vehicles

Every year the Michigan State Police (MSP) test new patrol vehicles as part of its procurement policy. This year, on September 16 through 20, the MSP tested 11 police package vehicles. This TAP Alert contains the preliminary results of the test. The full report is expected in November.

Each vehicle is subjected to six major tests and evaluations. The results are weighted to reflect the relative importance of each attribute as related to MSP operational requirements. Table 1 lists the tests and point scores.

The MSP scores each vehicle's overall performance, reviews the manufacturer's bid price, and calculates a final score for each vehicle using a sophisticated formula that combines the overall performance score and the manufacturer's price.

It should be noted that the MSP vehicle specifications, test categories, and scoring reflect MSP needs. If your department employs this or a similar method, consider your own needs carefully and alter the weighting factors accordingly.

Table 2 lists the vehicles alphabetically without regard to their performance on the tests.

Vehicle Dynamics Testing

Objective: To determine high-speed pursuit handling characteristics. The 1.635-mile road racing course contains hills, curves, and corners; except for the absence of traffic, it simulates actual pursuit conditions. The evaluation measures the vehicle's blending of suspension components, acceleration capabilities, and braking characteristics.

Table 1.
Tests and Scoring

Test	Points
Vehicle dynamics	30
Acceleration	20
Top speed	20
Brake testing	10
Ergonomics and communications	10
Fuel economy	10
Total	100

Methodology: Each vehicle is driven at least 15 timed laps by at least three drivers. The final score is the average of the fastest 12 timed laps.

Table 3 shows the average results of the vehicle dynamics test. (The results for every lap were not available for this bulletin. They will be available in the full report.)

Acceleration and Top-Speed Testing

Acceleration

Qualification Test Objective: To determine the ability of each vehicle to accelerate from a standing start to 60 mph within 12.7 seconds, 80 mph within 23.1 seconds, and 100 mph within 41.7 seconds.

Table 2.
Vehicles Tested

Vehicle	Engine
Chevrolet Caprice	5.7L (350 cid) TBI
Chevrolet Caprice	5.0L (305 cid) TBI
Chevrolet Caprice	4.3L (262 cid) TBI
Dodge Diplomat	5.2L (318 cid) 4BBL
Dodge Diplomat	5.2L (318 cid) 2BBL
Ford Crown Victoria	5.8L (351 cid) VV-H.O.
Ford Crown Victoria	5.0L (302 cid) PFI
Ford Mustang (automatic)	5.0L (302 cid) PFI-H.O.
Ford Mustang (5-sp. manual)	5.0L (302 cid) PFI-H.O.
Plymouth Gran Fury	5.2L (318 cid) 4BBL
Plymouth Gran Fury	5.2L (318 cid) 2BBL

VV = Variable venturi
BBL = Barrel
H.O.= High output
PFI = Port fuel injection
TBI = Throttle body injection

Table 3.
Results of Vehicle Dynamics Testing

Make/Model	Average*
Chevrolet Caprice 5.7L–TBI	1:26.20
Chevrolet Caprice 5.0L–TBI	1:28.83
Chevrolet Caprice 4.3L–TBI	1:32.51
Dodge Diplomat 5.2L–4 BBL	1:28.66
Dodge Diplomat 5.2L–2 BBL	NA
Ford Crown Victoria 5.8L–VV H.O.	1:28.24
Ford Crown Victoria 5.0L–PFI	1:29.49
Ford Mustang (auto) 5.0L–PFI H.O.	1:21.56
Ford Mustang (manual) 5.0L–PFI H.O.	1:22.51
Plymouth Gran Fury 5.2L–4 BBL	1:28.63
Plymouth Gran Fury 5.2L–2 BBL	NA

* Average time for fastest 12 laps. Times are in minutes, seconds, and hundredths of a second, i.e., 1:28.32 = 1 minute, 28 seconds, and 32/100 of a second.

NA = Not available; not tested for vehicle dynamics.

Competitive Test Objective: To determine acceleration time to 100 mph.

Methodology: Using a fifth wheel in conjunction with a microprocessor and integrated printer, each vehicle is driven through four acceleration sequences—two northbound and two southbound to allow for wind direction. The average of the four times is used to derive scores on the competitive test.

Top Speed

Qualification Test Objective: To determine the vehicle's ability to reach 110 mph within 2 miles.

Competitive Test Objective: To determine the actual top speed obtained within 14 miles from a standing start.

Methodology: Following the fourth acceleration run, the vehicle continues to accelerate to the top speed attainable within 14 miles from the start of the run. The highest speed attained within the 14 miles is the vehicle's score on the competitive test.

Table 4 summarizes the acceleration and top speed tests.

Braking Test

Qualification Test Objective: To determine the ability of the vehicle to make a panic stop within its own lane and to evaluate brake fade.

Competitive Test Objective: To determine the deceleration rate on two 60-to-0 mph impending skid stops. Vehicles are scored on their average deceleration rate attained in comparison with the other vehicles in the test group.

Methodology: Each vehicle is first required to make four decelerations at 22 feet per second using a deceleration rate formula from 90-to-0 mph, with the driver using a decelerometer to maintain the deceleration rate. The vehicle then makes a 60-to-0 mph impending skid.

The exact initial velocity at the beginning of the deceleration and the exact distance required to make the stop are recorded by means of a fifth wheel with electronic digital speed and distance meters. From these figures, the average deceleration rate for the stops is calculated. Following a 4-minute cooling period, this sequence is repeated. The second sequence is followed by one 60-to-0 mph panic stop to determine the ability of the vehicle to stop in a straight line within its lane and to detect evidence of brake fade.

Table 5 shows the results of the braking test. (Only one of each manufacturer's vehicles was tested since body sizes are essentially the same.)

Ergonomics and Communications

Objective: To rate the vehicle's ability to provide a suitable environment for patrol officers to perform their job, to accommodate the required communications and emergency warning equipment, and to assess the relative difficulty of installing the equipment.

Methodology: A minimum of four officers independently and individually score each vehicle on comfort and instru-

Free Software Helps Select Vehicles

Staff at the Law Enforcement Standards Laboratory (LESL) have created a computer program to help police fleet managers select patrol vehicles that are best suited to their needs. The program is called AutoBid and is based on the MSP patrol vehicle performance test data, which is presented in condensed format here.

AutoBid gives users two ways to assess vehicles: a performance-based method and a value-based method. Performance selection is based on vehicle test scores alone; it ranks vehicles on their overall performance independent of cost. Value selection is based on both vehicle cost and test scores; it identifies which vehicle is the best buy in terms of the lowest cost for equivalent test performance and ranks the vehicles by the bid price adjusted for performance. Help screens throughout the program explain how to use the program and the underlying concepts.

AutoBid runs on an MS-DOS ™ microcomputer with at least 384K of RAM. It can run directly from a floppy drive or be installed on a hard drive.

The Technology Assessment Program is making limited copies of AutoBid available free to law enforcement agencies. You can order your copy and accompanying documentation by writing to the TAP Information Center on your letterhead.

Table 4.
Results of Acceleration and Top-Speed Testing

Speed (mph)*	Chevrolet Caprice 5.7L–TBI	Chevrolet Caprice 5.0L–TBI	Chevrolet Caprice 4.3L–TBI	Dodge Diplomat 5.2L–4BBL	Dodge Diplomat 5.2L–2BBL	Ford Crown Victoria 5.8L–VV H.O.	Ford Crown Victoria 5.0L–PFI	Ford Mustang (auto) 5.0L–PFI H.O.	Ford Mustang (manual) 5.0L–PFI H.O.	Plymouth Gran Fury 5.2L–4BBL	Plymouth Gran Fury 5.2L–2BBL
0–20	2.23	2.46	2.84	2.72	3.14	2.67	2.19	2.00	1.84	2.58	3.30
0–30	3.54	4.19	5.02	4.45	5.43	4.52	3.99	3.38	2.65	4.26	5.57
0–40	5.12	6.27	7.64	6.24	7.74	6.53	6.10	4.83	3.84	6.12	8.00
0–50	7.29	9.13	11.48	8.82	10.52	8.79	8.77	6.40	5.38	8.65	10.85
0–60	9.82	12.35	15.57	11.84	14.38	11.98	12.39	8.60	7.04	11.77	14.98
0–70	13.34	16.99	20.90	15.51	19.32	15.64	16.47	11.02	9.38	15.32	19.97
0–80	17.59	23.35	29.80	21.69	25.36	20.46	21.88	13.85	11.82	20.97	26.41
0–90	22.67	30.89	41.09	29.02	35.89	27.13	29.34	18.02	14.96	28.25	37.73
0–100	29.35	42.88	58.16	38.95	55.58	36.55	42.14	22.89	19.24	38.02	58.13
Top Speed in mph	122.00	114.10	109.00	119.10	113.60	119.10	110.00	137.20	138.00	120.20	111.20

* 4-run average in seconds

Table 5.
Results of Braking Test

	Chevrolet Caprice 5.7L–TBI	Dodge Diplomat 5.2L–4BBL	Ford Crown Victoria 5.8L–VV H.O.	Ford Mustang (manual) 5.0L–PFI H.O.	Plymouth Gran Fury 5.2L–4BBL
Phase I					
Initial speed (mph)	60.3	59.4	60.7	59.2	59.9
Stopping distance (ft)	152.8	146.8	154.4	158.0	146.5
Deceleration rate (ft/sec2)	25.60	25.85	25.67	23.86	26.34
Phase II					
Initial speed (mph)	60.4	60.1	60.9	60.4	59.7
Stopping distance (ft)	148.3	145.1	150.5	156.7	149.3
Deceleration rate (ft/sec2)	26.46	26.78	26.51	25.04	25.68
Average Deceleration Rate (ft/sec2)	26.03	26.32	26.09	24.45	26.01
Stopping distance from 60 mph based on average deceleration rate (ft)					

Table 6.
Results of Ergonomics and Communications

Vehicle	Score*
Chevrolet Caprice	189.60
Dodge Diplomat	190.20
Ford Crown Victoria	168.53
Ford Mustang	144.40
Plymouth Gran Fury	190.20

* Scores are the total points the automobile received for each of 29 attributes the MSP consider important in determining the acceptability of the vehicle as a patrol car—for example, front seat adjustability, clarity of instrumentation, visibility front and back. The higher the number, the better the vehicle scored.

mentation. Personnel from the Radio Installation and Garage Units conduct the communications portion of the evaluation based on the relative difficulty of the necessary installations. Each factor is graded on a 1-to-10 scale with 1 representing totally unacceptable and 10 representing superior. The scores are averaged to minimize personal prejudice.

Table 6 shows the results of the ergonomics and communications test. (Only one of each size vehicle was tested since the interior dimensions are essentially the same.)

Fuel Economy

Objective: To determine fuel economy potential. The scoring data are valid and reliable for comparison but may not necessarily accurately predict the car's actual fuel economy.

Methodology: The vehicles are scored based on estimates for city fuel economy to the nearest 1/10th mile per gallon developed from data supplied by the vehicle manufacturers.

Table 7 shows the estimated EPA fuel economy.

If you would like a copy of the full report when it is available in November, write or call the Technology Assessment Program Information Center, Box 6000, Rockville, MD 20850, 800–248–2742 (301–251–5060 in Maryland and Metropolitan Washington, D.C.).

The Technology Assessment Program is supported by Grant #85-IJ-CX-K040 awarded by the National Institute of Justice, U.S. Department of Justice. Analyses of test results do not represent product approval or endorsement by the National Institute of Justice, the National Institute of Standards and Technology, the U.S. Department of Commerce; Aspen Systems Corporation; or the Michigan State Police.

The Assistant Attorney General, Office of Justice Programs, coordinates the activities of the following program Offices and Bureaus: National Institute of Justice, Bureau of Justice Statistics, Bureau of Justice Assistance, Office of Juvenile Justice and Delinquency Prevention, and Office for Victims of Crime.

Table 7.
Fuel Economy

Make/Model	Combined city/highway EPA miles per gallon
Chevrolet Caprice 5.7L–TBI	14.3
Chevrolet Caprice 5.0L–TBI	17.2
Chevrolet Caprice 4.3L–TBI	19.0
Dodge Diplomat 5.2L–4 BBL	12.7
Dodge Diplomat 5.2L–2 BBL	14.2
Ford Crown Victoria 5.8L–VV H.O.	13.1
Ford Crown Victoria 5.0L–PFI	17.4
Ford Mustang (automatic) 5.0L–PFI H.O.	16.8
Ford Mustang (manual) 5.0L–PFI H.O.	16.9
Plymouth Gran Fury 5.2L–4 BBL	12.7
Plymouth Gran Fury 5.2L–2 BBL	14.2